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Volume 13 Number 2 & 3
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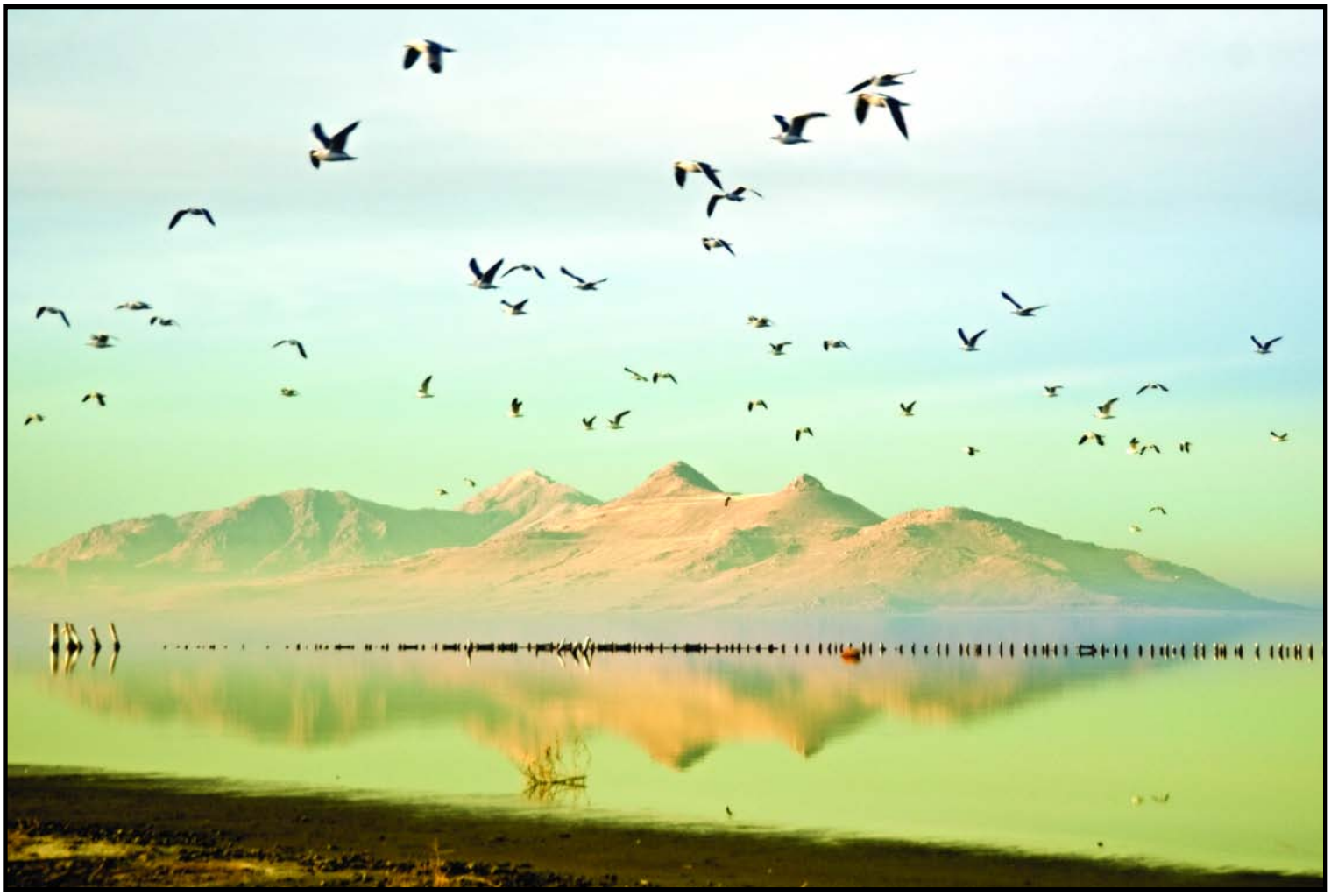

Gulls by Charles Uibel ©2007

The mission of FRIENDS of Great Salt Lake is to preserve and protect the Great Salt Lake ecosystem and to increase public awareness and appreciation of the lake through education, research, and advocacy.

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Executive Director's Message

In Consideration of the Public Trust Values of Great Salt Lake and the Statutory Responsibility of the Division of Forestry, Fire and State Lands to Protect Them.

"If you consider saline systems across the West, Great Salt Lake is the most important site in North America for aquatic bird communities. As an interior system, Great Salt Lake is arguably the most important single interior wetland site in North America. On the other hand, we have not treated the lake kindly. Out of the remaining functional saline lakes in the West, it is the most impacted by human activity."

Don Paul, Great Basin Bird Conservation Region Coordinator, Intermountain West Joint Venture.

By law, the Division of Forestry, Fire and State Lands is required to ensure that any use of Great Salt Lake does not interfere with navigation, fish and wildlife habitat, aquatic beauty, public recreation, and water quality on and in the lake. Moreover, protection of these values trumps any other use of sovereign lands and cannot be superseded in the name of economic development or payment to the State.

In April, FRIENDS and the National Audubon Society, with the assistance of Western Resource Advocates, submitted comments to the Division of Forestry, Fire and State Lands ("Division") and the Resource Development Coordination Committee ("RDCC") on a mineral lease nomination by GSL Minerals of 23,088 acres in Clyman Bay. GSL Minerals wants to expand the size of its facility to increase the production capacity of potassium sulfate, a fertilizer used for agriculture.

GSL Minerals has been operating on the shores of the lake since 1970. The existing facility is comprised of 43,000 acres of solar evaporation ponds, pump stations, dikes on both sides of the lake - in Gunnison Bay and Bear River Bay, and the 21 mile underwater canal, the Behren's Trench. This project would nearly double the size of its operations to 76,000 acres or 119 square miles. This means that GSL Minerals will have an area under development that is larger than Salt Lake City, which is 110 square miles. This development will encompass 13 percent of the total area of the lake when waters are low, and 7 percent of the lake when its levels are average.

We urged the Division and the RDCC to reject the mineral lease nomination until sufficient information has been acquired and analyzed so that the impacts of this massive diking, evaporation and extraction proposal could be fully understood. We set forth the Division's legal responsibilities in managing Great Salt Lake, both in regard to its accountability to the public trust and its site-specific planning obligations that are implicated by this nomination.

The lease includes shoreline playa, mudflat wetlands, and the waters of Great Salt Lake. Added to the already existing operations in this area, several miles of new dikes would be constructed, with supporting channels and pump stations. Among other things, this effectively moves the entire footprint of the operation to within two miles of Gunnison Island, a protected area for the third largest breeding colony of American White Pelicans in North America. To protect the nesting birds from boats and airplanes, there is a one mile buffer around the Island.

It is possible that construction for the expansion might disrupt nesting pelicans, California gulls and peregrine falcons, that also inhabit the island. Characteristically, dikes provide easy access for predators and humans to places that might be otherwise remote.

The Division of Wildlife Resources, which also has a public trust responsibility to oversee the wildlife resources of the State, submitted an extensive list of concerns about impacts from the project. Among those concerns is the possibility that juvenile pelicans might

confuse the proposed ponds with a potential forage site which could be life threatening, the elimination of natural springs that provide critical wildlife water resources, threats to the potential nesting habitat for snowy plovers - a state sensitive species, and threats to nesting birds on Dolphin Island.

Not included in the formal nomination but an integral part of the expansion and additional cause for concern is the proposed development of 8,000 acres in Bear River Bay. Bear River Bay is recognized as a Utah Important Bird Area by National Audubon. An area, which of all the important aquatic bird environments on the Lake, is the sweetest spot for diversity and numbers of aquatic birds during long-term average lake elevation periods; a veritable avian oasis. It is here where GSL Minerals intends to transfer the concentrated brine from the west side of the lake to an expanded system of solar ponds for further evaporation from May through September. And it is here where a profoundly unique exchange of water between the Willard Spur and Bear River Bay exists. This exchange creates a lens of fresh water that lies on top of the chemocline that exists on the floor of the bay. It is an extremely fragile situation and important system over time for birds.

"Bear River Bay is the freshest region and receives the largest volume of riverine inflow. Its near-surface salinity is similar to that of the Bear River. This system is bounded on the north and east by state, federal, and private wetlands; on the south by industry; and to the west by the Promontory Mountains. This bay is fresh enough to support a community of submergent hydrophytes including sago pondweed (Potamogeton pectinatus) and widgeon grass (Ruppia maritima). There are significant islands of emergent wetlands here, especially in the east part of the bay in the Willard Spur. . . . An ecological element of vital importance to pisciverus birds in this area is the fishery that persists when the lake elevation is higher than 4,200 feet (1,280.2 m) above sea level. The avian community at Willard Spur is exceptionally complex. With its species richness, diversity and overall abundance, this area continually provides one of the most magnificent displays of bird life on the lake. Although the smallest region on the lake, it makes an exceptional contribution to the lake's avian population."[1]

It would be naive to think that converting 33,000 acres of the bed of Great Salt Lake into giant evaporation ponds and dikes would not have impacts on the public trust values. Oh yes, and there are those oil and gas leases that are also being proposed for this area of the lake. Could this be the litmus test for the Division and RDCC to demonstrate how serious they are to protect the public trust resources?

There will be an opportunity for the public to participate in this process, so check our website for further details and updates. But in the meantime, perhaps this is a good time for all of us to do a little soul searching about our commitment to the lake and how serious we are about our public trust values. After all, it's not only about our future, but the future of this hemispherically important ecosystem.

In saline,

Lynn de Freitas

What You Can Do

Check our website: www.fogsl.org for updates and further details as they develop.

The Division of Forestry, Fire and State Lands invites public comment on this nomination until the Record of Decision is made. Call 801-538-5504 with any questions you have for the Division. Please send comments to:

Dave Grierson, Ecosystem Manager Coordinator
Utah Division of Forestry, Fire and State Lands
PO Box 145703
Salt Lake City, Utah 84114-5703
davegrierson@utah.gov

[1]Aldrich, T and Paul, D. 2002 Avian Ecology of Great Salt Lake. Great Salt Lake: An Overview of Change. (ed) J. W. Gwynn, Ph.D.

FRIENDS ORGANIZATIONAL STATEMENT

FRIENDS of Great Salt Lake was founded in 1994. The mission of FRIENDS is to preserve and protect the Great Salt Lake Ecosystem and to increase public awareness and appreciation of the lake through education, research, and advocacy. The long-term vision of FRIENDS is to achieve comprehensive watershed-based restoration and protection for the Great Salt Lake Ecosystem.

FRIENDS has a very active Board of Directors and an Advisory Board consisting of professionals in the scientific, political, literary, education, and broadcast communities. The organization sponsors an array of programs, activities, and materials in pursuit of its mission.

Every two years, FRIENDS hosts the Great Salt Lake Issues Forum to provide a focused discussion about the Lake for policy makers, researchers, planners, industry and other stakeholders. The goal of each Forum is to encourage constructive dialogue about the future of the lake's ecosystem and its resources, and to illuminate the complexities involved in research, management and planning for the lake.

The Friend of the Lake Award, given at each forum, acknowledges a citizen, business or organization working to promote GSL awareness in the community.

In 1997, Bruce Thompson was hired as Education Director to initiate a major regional education project designed to enhance both the knowledge about and care for the future of Great Salt Lake. Bruce wrote and produced a live-narrative slideshow program "The Lake Affect: Living Together Along the Shores of Something Great." The program is now available on DVD.

In 2000, Project SLICE, a 4th grade curriculum using Great Salt Lake as a system of study was initiated. It consists of 7 units of study, a Speakers Network, Teacher Training Workshop, and Lakeside Learning Field Trips. Currently work is being done to expand the curriculum into other grades.

In 2005, FRIENDS hired Katie Pearce as Assistant Director, who is working to refine the Project SLICE curriculum and expand education outreach into the Great Salt Lake community.

In 2002, the Doyle W. Stephens Scholarship Award was established. The scholarship provides support to undergraduate and graduate students engaged in new or ongoing research that focuses on Great Salt Lake.

In 2006, FRIENDS was the recipient of the Calvin K. Sudweeks Award by the Utah Water Quality Board for outstanding contributions in the water quality field.

In 2002, President Lynn de Freitas, was awarded the outstanding volunteer educator award by the Utah Society for Environmental Education.

In 1998, FRIENDS was awarded the Conservation Achievement Award by the Utah Chapter of the Wildlife Society.

On the Cover

Gulls by Charles Uibel ©2007

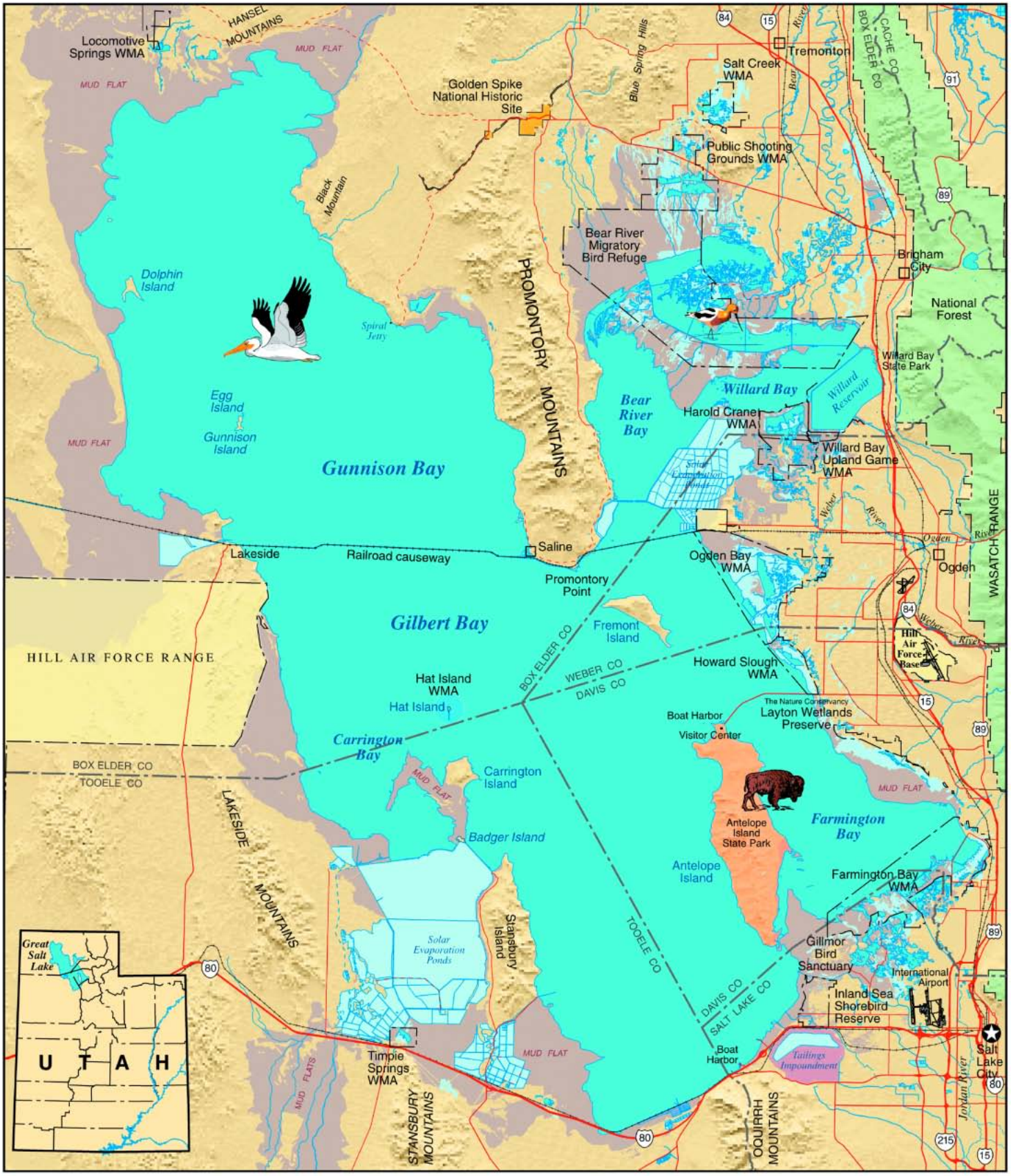
Charles rediscovered the lake and has been photographing it for the past two years after helping to create Stephen Trimble's website www.stephentrimble.net and after hearing Trimble give some inspiring talks about the beauty and preservation of the Great Salt Lake.

He created the website GreatSaltLakePhotos.com as a place to showcase not only his own photos of the lake, but also from others who share the passion. His hope is that it will be the first stop for people around the planet to see photos of the Great Salt Lake.

Charles has won awards from the Monte L. Bean Life Science Museum at BYU and the Utah State Fair for his photography. He lives with his wife Crystal, and their dog, Tess in Salt Lake City.

For more information, contact Charles at 801-573-1688 or visit www.greatsaltlakephotos.com.

Great Salt Lake at a Glance



Courtesy of USGS

NorthWest Quadrant Process

Shaping the Future of the Lakeshore Community

Salt Lake City has long awaited a comprehensive land use plan to provide guidance for development in the Northwest Quadrant of the City; the Lakeshore Community. The Lakeshore Community includes the incorporated area of the City located between the Bangerter Highway and the west City limits (8800 West) from 2100 South to the north City limits (3700 North). For many years the designated uses for this area have been regulated only through zoning without future growth policy guidelines.

The Lakeshore Community Master Plan will reflect the City's vision for a viable, healthy, sustainable community. It will provide a foundation to shape the area's future development, enhance connections to surrounding neighborhoods and the Wasatch Region. The master plan for the Lakeshore Community will guide new development, land use activities and zoning decisions. The plan, when completed, will reflect the values of the community and lay the foundation for how the community will grow over time.

Several plans have been developed in recent years that have projected new uses and development in the northwest corner of Salt Lake Valley. The Salt Lake County Shorelands Plan looked intently at the area around the shores of Great Salt Lake to understand where development would or would not be suitable in the context of the wetlands and the wildlife present. The results of that plan, and the Special Area Management Plan (SAMP) tied to it, will be valuable tools for understanding the existing resources in this area. Salt Lake County's West Bench General Plan, nearing completion, also provides a glimpse into what people envision is possible in this area. Another plan that will have a major impact on the west side of the valley is the Mountain View Corridor proposal for a new freeway. This heightened access will bring new opportunities for development of all types. Clearly, the time is right for Salt Lake City to put forth its vision for what this area might become. Salt Lake City needs a land use policy plan to define growth boundaries and provide appropriate policies to address impacts on natural resources, infrastructure, fiscal soundness, and quality of life.

The City will focus on creating a sustainable community that complements and supports downtown. The City of Salt Lake is a community that cares deeply about its future, a community that supports good urban form, a community that seeks fiscal responsibility in its anticipated growth, and a community that strives to balance the wishes of individual citizens with the realities of maintaining and enhancing the living environment of the greater community.

There are many environmentally sensitive lands in this area including wetlands and wildlife habitat. The Lakeshore Master Plan process will define development guidelines for the types of land uses and the location of future development as well as define areas desired for limited or no development. Evaluation of the planning area will involve construction of constraint levels that regulate development. The Shorelands Plan and the related SAMP Special Area Management Plan's Functional Assessments of Wetlands and Wildlife provides an initial assessment for the evaluation of wetlands quality and the identification of wildlife habitat areas. These documents will be resources to identify the location and levels of development constraints in the planning area.

Salt Lake City has obtained a master plan consulting team that consists of several consulting firms to create a comprehensive team to assist in the development of the master plan. The lead team is EDAW, Inc from Ft. Collins, Colorado. The secondary team is MGB+A of Salt Lake City. These two teams will direct the overall management and tasks of the consulting services necessary to develop the Lakeshore Community Master Plan. There are three specialty-consulting firms to assist with the transportation (Fehr & Peers), environmental (SWCA) and economic development (Bonneville Research) elements of the master plan. Project and contact information for the Lakeshore Community Master Plan can be obtained at the City's web site: www.slcgov.com/ced/planning/pages/NWQ-MasterPlan.htm.

Everett Joyce,
SLC Planning Department

South Shore Uninterrupted by Charles Uibel (www.greatsaltlakephotos.com)

SWJV Groundwater Project

Facilitating the Cleanup and Return of an Impacted Resource

The Southwest Jordan Valley Groundwater project is a two fold project, addressing two separate zones of the principal alluvial aquifer in response to two separate authorities. Zone A is comprised of a low pH core (pH approximately 3.5) with elevated sulfate (1,500 to >20,000 parts per million, ppm, or milligrams per litter, mg/l) and metals. The core is surrounded by a larger area with circum-neutral water with an approximate average sulfate concentration of 2000 ppm. Zone B is primarily impacted by sulfate with an approximate average sulfate concentration of 700 to 900 ppm. Figures and maps demonstrating both zones have focused on the highest concentration of sulfate found in any of the aquifer depth zones investigated, because sulfate more readily migrates through the aquifer in comparison to the other known contaminants.

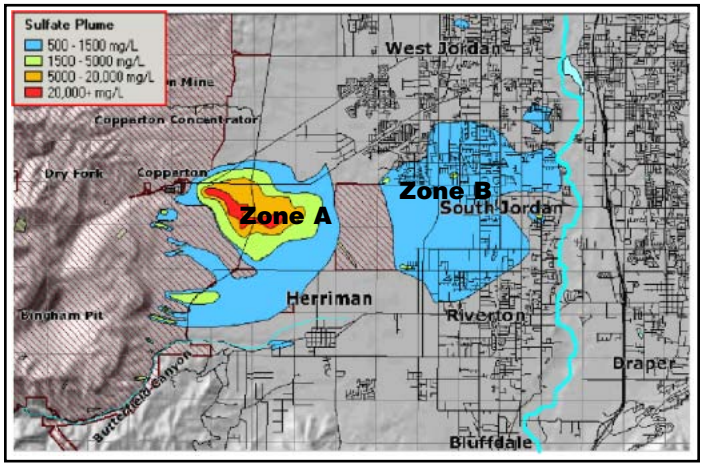


Figure 1

Both zones are distinct from each other due to the historical sources from which they are derived. The primary source for Zone A (western shaded area) was the historic (previously remediated) Bingham Reservoirs and the primary source for Zone B (eastern shaded area) was the historic (previously remediated) South Jordan Evaporation Ponds. Hydraulic conductivity, groundwater velocity, and other aquifer mechanics have affected the migration of both plumes.

CERCLA Selected Remedy For Zone A

The remedies being employed for both plumes fall under the oversight scope of two regulatory agencies, the U. S. Environmental Protection Agency, Region VIII (EPA) via its CERCLA (1980 Comprehensive Environmental Response, Compensation, Liability Act) authority and the Utah Department of Environmental Quality (DEQ) via the authority provided to the State Trustee for Natural Resource Damages (State NRD Trustee) under CERCLA. The EPA and DEQ are both involved in overseeing the implementation of the remedy selected under CERCLA for the acid plume in Zone A (as documented under the 2000 Record of Decision, subsequently clarified by the 2003 Explanation of Significant Difference (ESD), and proposed for clarification through another ESD dated December 2006).

The selected remedy requires the extraction of water associated with the core of the acid plume in Zone A and delivery of the extracted water to Kennecott's tailings pipeline. The extracted core water undergoes neutralization in the pipeline due to the inherent neutralization potential of the mine tailings and/or the addition of lime by Kennecott to the tailings pipeline. The associated dissolved metals in this core water are precipitated as a solid, non-hazardous compound which is permanently stored in the North Tailings Impoundment. The extracted volume of core water from the acid plume represents approximately 2% of the total combined flow that is managed in the tailings pipeline.

The selected remedy also requires that a series of barrier wells located along the leading edge of the acid plume extract water from the larger sulfate plume of Zone A to maintain containment of waters with a sulfate concentration of 1,500 ppm within the boundaries clarified in the proposed December 2006 ESD and delineated in the October 2006 Operation, Maintenance & Replacement plan. Pursuant to the proposed December 2006 ESD the extracted acid plume water has to be managed in a manner "…that is both consistent with the quality of the water, previous decision documents, and acceptable to EPA and DEQ". Proposed (and/or accepted) management options can include delivery of the extracted water from the barrier wells to the Bingham Canyon Water Treatment Plant (Zone A Reverse Osmosis Plant) to allow Kennecott to fulfill its contractual obligations under the 2004 NRD Three Party Agreement (a separate DEQ action).

	June '06	July '06	Aug. '06	Sept. '06	Oct. '06	Nov. '06	Dec. '06	Total
Feed[1]	404.0	414.3	402.0	400.6	321.9	394.9	378.3	2716.0
Permeate[1]	283.0	290.3	281.0	280.1	227.1	276.3	265.3	1903.1
Efficiency	%70.0	%70.1	%69.9	%69.9	%70.6	%70.0	%70.1	%70.06
Final[1,2] Product	327.7	336.5	326.8	326.5	260.1	317.4	304.8	2199.8

[2] Final Product is the combined permeate and re-mineralization blend meeting Utah Primary and Secondary Drinking Water Standards.
[1] Feed, Permeate, and Final Product values are in acre-feet
* (1 acre-foot is enough water to provide a family of four, water for a year)

Figure 3

Proposed ESD and Federal Consent Decree, Public Review

The proposed December 2006 ESD recently underwent a public review (November 6, 2006 to December 8, 2006) and comments were received by the EPA and DEQ (agencies). Prior to the completion of the ESD, the agencies will review the comments received and prepare a response summary to be placed in the administrative record. To ensure that the regulatory agencies can enforce the continued implementation of the selected remedy, both agencies will shortly bring forth a complaint and subsequent Remedial Design (RD) Consent Decree before the Federal District Court of Utah. The RD Consent Decree is a tool that provides means to which the EPA and DEQ can assure that over time, the active and passive remediation goals for Operable Unit No. 2 (acid plume of Zone A) are met. After the complaint is filed and the Federal Consent Decree is lodged with the Federal District Court of Utah, the EPA and DEQ will notice the availability of the RD Consent Decree for review and comment by the public in the Federal Register. This review period will provide the public with an opportunity to review the RD Consent Decree between the Federal and State CERCLA authorities and Kennecott. As previously agreed, the EPA and DEQ will provide a briefing on the Federal Consent Decree to the State NRD Trustee's Stakeholder Forum (dates for such activities are not currently available). The RD Consent Decree is complementary to the 2004 Three Party Agreement signed by the State NRD Trustee, Kennecott and the Jordan Valley Water Conservancy District.

Efforts to Address State NRD Contractual Obligations

Since acceptance by the State NRD Trustee of the August 2004 joint proposed project from Kennecott and the Jordan Valley Water Conservancy District (District), Kennecott and the District have both moved forward with work to design, engineer, construct and operate their respective portions of the project in compliance with contractual obligations. On May 23, 2006 the State NRD Trustee deemed the Bingham Canyon Water Treatment Plant to be complete and operational. Since then the plant has been providing treated water from Zone A to the District (Figure 3). The District has initiated and continues to complete the engineering of the treatment plant and associated wells/piping to be constructed to facilitate the attainment of their contractual obligations for Zone B.

Public Involvement Opportunities

The Division of Water Quality continues to chair meetings of the Great Salt Lake Steering Committee and Science Panel, which have been tasked to assist the Division in drafting a proposed numerical water quality standard for selenium in the open waters of the Great Salt Lake. This group continues to meet periodically. Please refer to the following website for meeting schedules: http://www.deq.utah.gov/Issues/GSL_WQSC/index.htm.

The State NRD Trustee continues to chair meetings of the Stakeholder Forum group which periodically meets to discuss topics related to ongoing remedial work performed at Kennecott Utah Copper Corporation. Please refer to the following website for meeting schedules: http://www.deq.utah.gov/Issues/nrd/index.htm#stakeholder.

Douglas Bacon (dbacon@utah.gov)
State of Utah,
Division of Environmental Response & Remediation

Kennecott Utah Copper Corporation

Sense of Quite Confidence

Summer Wheat Field by Charles Uibel (www.greatsaltlakephotos.com)

A back issue of High Country News landed on my desk recently. The May 1994 issue headlined "Can mining come clean?" and devoted six pages to describing Kennecott's environmental legacy and questioning whether Kennecott should be trusted to remedy the environmental impacts of nearly a century of mining.

In 1994, Kennecott sought the trust of the local community, the State of Utah, and the Environmental Protection Agency to be able to continue its environmental cleanup, which had begun years earlier, without the bureaucracy, higher cost, longer timeframe, and stigma of being listed on the National Priorities List. A formal agreement with the state and EPA was reached in 1995 deferring listing and allowing Kennecott to manage the clean up work.

The community and the agencies were right to place their confidence in Kennecott which has proactively, aggressively, and confidently cleaned-up contaminated soils and groundwater, and placed robust controls on the sources of land, air, and groundwater contamination.

Confidence in the Process

Kennecott is in the process of signing a Consent Decree with the federal and state governments for the clean-up of groundwater contamination near the Bingham

Canyon Mine called the Zone A plume. This agreement is complimentary to the agreement signed in August 2004 with the State of Utah and the Jordan Valley Water Conservancy District.

Although Kennecott has long been conducting remediation of the Zone A plume, the Consent Decree is a formal and legally-binding commitment to continue the groundwater clean-up. The agreement safeguards public interests by providing the agencies with enforcement tools to assure that the work is completed, including monetary penalties for failing to meet performance standards, work takeover provisions to allow the government to assume control for the clean-up, and financial assurance to cover the government's cost if they had to assume control.

The Consent Decree is good business for Kennecott because it provides certainty about the work required, how performance is measured, and the process for working with the agencies. It is an important step towards withdrawal of EPA's proposal to list the Kennecott site on the National Priorities List.

Confidence in the Remedy

The Consent Decree is the legal culmination of a deliberative technical process of characterizing the nature and extent of groundwater contamination, analyzing alternatives for containing and remediating the plume, selecting a preferred remedy, and developing a work plan to implement the remedy. This process, which has been transparent, open to public input, and overseen by EPA and UDEQ, has resulted in a remedy that is robust, achievable, and will not result in deleterious impacts to other natural resources such as Great Salt Lake.

The remedy for the Zone A plume includes extraction and treatment of acidic water from the core of the plume that has elevated sulfate and metals concentrations as well as water from the neutral margin of the plume. Treated waters have metals concentrations well below regulatory limits and are either recycled in KUCC's process water system or discharged to Great Salt Lake. Metals in water from the acidic core are precipitated as a solid phase during neutralization. These solids are co-deposited with fine-grained mill tailings in the North Tailings Impoundment adjacent to Great Salt Lake where hydrologic, geochemical, and geotechnical conditions assure that the solids will have long-term stability.

Confidence in the Future

Kennecott began actively pumping and treating contaminated groundwater from the Zone A plume in 1997. Pumping has significantly reduced contaminant mass in the aquifer, perhaps by as much as 50%. Contaminant levels are expected to continue dropping significantly over the next few years. However, predictive work indicates a long tail to the clean up effort, likely stretching over decades.

Kennecott intends to actively manage and fund the groundwater clean-up work through completion as committed to in the Consent Decree. Kennecott will be actively mining at Bingham Canyon for a good number of years to come. The end of mining, however, will not bring an end to Kennecott's commitment to complete the work. Kennecott is part of the Rio Tinto group, which has a solid record of successfully closing mining operations.

Confidence in Community Relationships

Social and environmental advocacy groups, such as FRIENDS, have played an important role in affecting a sea change in how mining companies do business. The industry now speaks of the "social license" to operate: it is no longer enough to simply procure tangible regulatory approvals, companies must secure and maintain majority acceptance in communities where they operate.

As an essential aspect of its social license to operate at Bingham Canyon, Kennecott has assumed the activist role in righting the environmental missteps of the past. A thoughtful man once said "The activist is not the man who says the river is dirty. The activist is the man who cleans up the river." As groundwater, soil, and wetland clean-up efforts move steadily forward with a sense of quiet confidence, groups such as FRIENDS should be there not only to speak out with concerns, but also to celebrate successes in accomplishing remediation goals.

Kelly Payne
Principal Advisor, Closure and Remediation
Kennecott Utah Copper Corporation
(kelly.payne@kennecott.com)

Great Salt Lake Education

Coming Soon: Lakeside Investigations
A Middle School Experience at Great Salt Lake

"I like to play indoors better 'cause that's where all the electrical outlets are."
- fourth grader in San Diego
From: Last Child in the Woods by R. Louv

What is FRIENDS doing to get more students outside?

We are running a successful 4th grade program called Lakeside Learning at Antelope Island. But what about all the other students besides 4th graders that need to get outside?

For the older, middle school set we offer a new core standards integrated science program. The new FRIENDS middle school place based program will be called "LakeSide Investigations" (LSI) and is intended to be a scientific methods based research trip to Great Salt Lake.

Our decision to offer a new program was based on three main ideas:

- Middle school is underrepresented in Great Salt Lake place based education.
- 4th grade Great Salt Lake place based education is oversaturated with offerings.
- Respondents to a FRIENDS education survey requested a Lakeside learning type program for older students. We acted upon this request by developing "LakeSide Investigations".

The goal of "LakeSide Investigations" is for students to gain experience using the scientific method in the context of Great Salt Lake. Research questions will focus on water quality (temperature, pH, nitrate and dissolved oxygen concentrations) comparing Farmington Bay and two locations in the main body of the lake. Students will pick research questions, write hypotheses to be tested, and study field instrumentation before coming out to Antelope Island State Park.

When at the lake, students will meet on the Antelope Island Causeway where they will take part in a lakeside introduction and orientation. From the causeway, students will take their first two sets of data from Farmington Bay and the open waters of the lake. After some observations and data collection, the group will move to Ladyfinger Point for lunch.

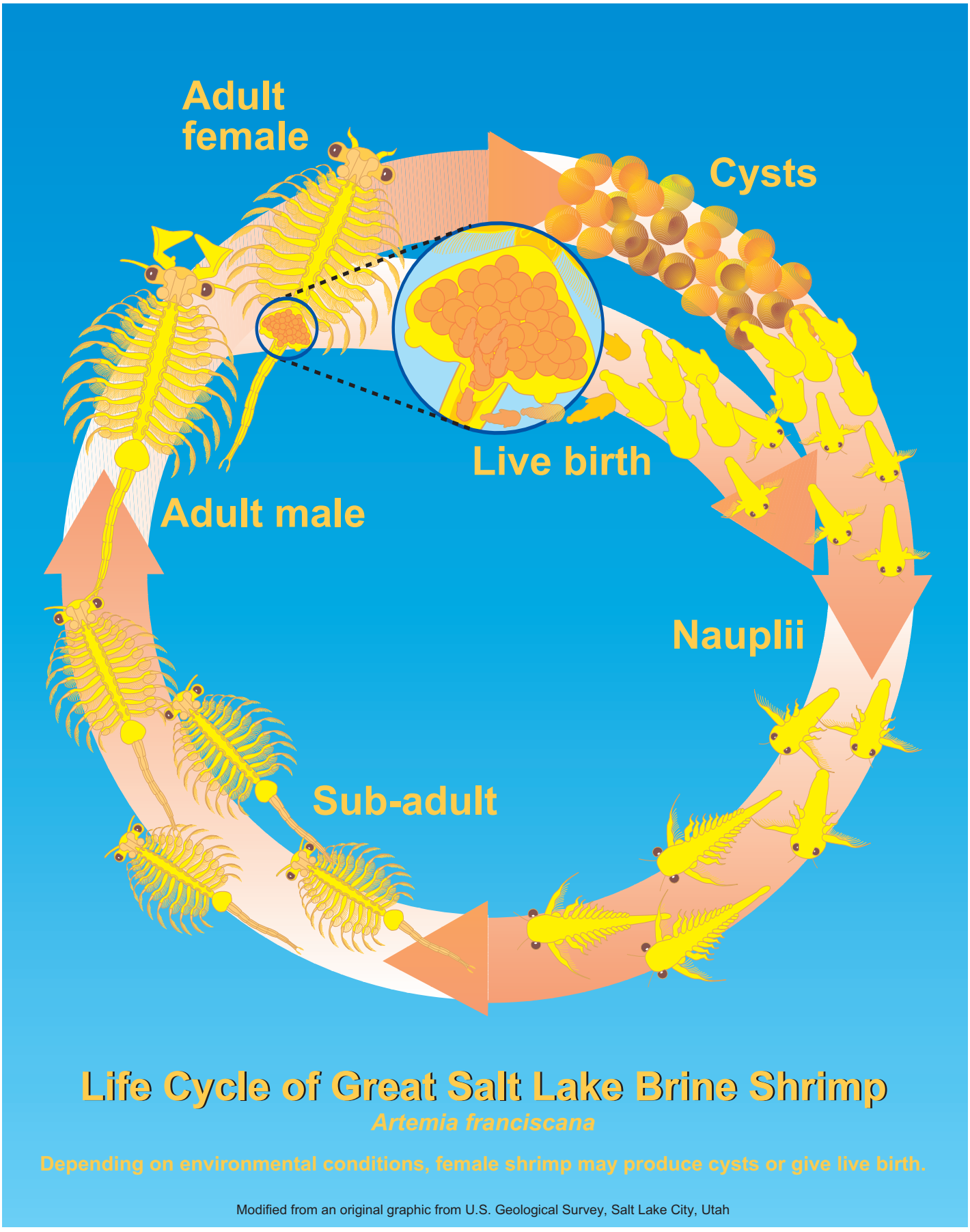
To collect data at their third location, students will loose their shoes and socks to get in the water at Bridger Bay. This is a perfect location to examine macro-invertebrates of the lake as well as enjoy the oolitic sands and the views, of course.

The analysis and synthesis of data will start at Bridger Bay and continue back in the classroom where students will have the opportunity to present their research findings in poster or PowerPoint form. Ultimately we would like to post all student data on the FOGSL website in order to compare seasonal changes, as well as yearly changes in water quality factors.

We are very excited about offering this new Great Salt Lake field opportunity. As always, running these trips takes incredible volunteers. If you or anyone you know is interested in volunteering to spend a day at the lake with 4th grader or middle school students, please let us know. We could use your help!

"Those who contemplate the beauty of earth find reserves of strength that will endure as long as life lasts." - Rachel Carson

Alisa Felton, Chair
FRIENDS Education Committee


Adult female
Cysts
Live birth
Adult male
Nauplii
Sub-adult
Life Cycle of Great Salt Lake Brine Shrimp
Artemia franciscana
Depending on environmental conditions, female shrimp may produce cysts or give live birth.
Modified from an original graphic from U.S. Geological Survey, Salt Lake City, Utah

DR. EPHYDRA - WE WELCOME YOUR QUESTIONS VIA EMAIL OR PHONE

E•phy'•dra, a noun; a genus of two species of brine flies that live on the bottom of the Great Salt Lake as larvae and pupae, and along the shores of the Lake as adults.

Brought to you by the Science Committee to help explain the science surrounding Great Salt Lake. We welcome your questions via email or phone. Contact Lynn de Freitas at ldefreitas@earthlink.net

Great Salt Lake Wetlands

Wetland Complexes in the Greater Great Salt Lake Ecosystem

Dr. Donald Currey, a noted authority on the Great Basin, described our area as a hemiarid lake basin. This is an area where aridity and tectonic activity both occur. Our water sources are high elevation areas with water balance surpluses. In the basin areas, fault lines formed by the tectonic activity, allow some of this water to be transported to the surface as springs and seeps, which in turn form wetlands in the arid basins.

In areas with few impacts, these wetlands are often part of large complexes which issue from fault line spring systems. Two such systems are found in the Salt Wells complex on the north end of Great Salt Lake, west of Promontory Point, and the Blue Lake complex about 16 miles south of Wendover. To have a look at these complexes on Google Earth go to about 41° 44' 29" N, 112° 41' 15" W for Salt Wells wetland complex and 40° 30'66" N, 114°00'19" W for the Blue Lake complex. The springs feeding these complexes are moderately saline to highly saline. They are also thermal springs. Both complexes consist of springs, shallow depression ponds, overland flow slopes, playa depressions, small

spring fed streams and saline mineral flats that range from permanent to seasonal in duration. The subclasses lacking are freshwater subclasses and lacustrine fringe. Neither system reaches the Great Salt Lake on the surface.

In the Beck Street area of Salt Lake City is a fault line called the Warm Springs fault and nearby another fault known as the Hobo Springs fault. Along these faults there are four large springs. From south to north, they are Wasatch Warm Springs (former location of the Children's Museum), Clark Warm Springs, Hobo Hot Springs and Beck's Hot Springs. In an area 3 miles long and ? mile wide, there are 50 or more springs. Beck's Hot Springs is both the largest and the hottest of springs with a discharge of 60-450 gpm, depending on the season and year, and a temperature of 130-132 ° F. The water is very saline with EC (electrical conductivity) of 19.4 – 21.6 dS/m. On the southern end of the fault, Wasatch Warm Springs has temperatures of 105-108 ° F. and water runs from fresh to moderately saline (6-8 dS/m and higher in severe drought 13.7 dS/m).

Beck's Hot Springs formed a stream between 4-6 ft wide and about six inches deep, which flowed into a lake (Hot Springs Lake) slightly to the west. Hot Springs Lake was about three miles long and one mile wide. It emptied into the Jordan River. The lake was said to contain fish and one pioneer reports there being several thousand of snipes or plovers. Major Howard Stansbury reported large numbers of waterfowl using the lake in the winter. A depiction of Beck's Hot Springs is in his expedition notes. It is titled 'Hot Spring- three miles from Great Salt Lake City'. The lake was used to launch boats into the Jordan River, then into Great Salt Lake. It was also considered a safe place for yachting.

The area from the springs to the Jordan River was dotted with springs, other small ponds and lakes and swampy areas. This wetland complex would have been between 3 and 7 square miles in area not including any riverine wetlands that existed along the Jordan River. This equates to between 1920 – 4480 acres of wetlands, which no longer exist. Hot Springs Lake was drained in 1915. The other surrounding wetlands and springs were drained by drainage tiles, ditches and others are piped into the ditches.

This Warm Springs wetland complex was a more diverse complex than those at Salt Wells and Blue Lake. In addition to wetland classes and subclasses in those complexes, this system also contained a lake, freshwater wetlands, the Jordan River and its wetlands. The only remains of this complex are a small restoration near Wasatch Warm Springs called Warm Springs Park and a few ponds near the oil refineries.

The Warm Springs fault is a part of the Wasatch fault. Along this fault line and also at the toes of alluvial fans along the foothills, there are thousands of springs. Some of these formed large complexes of wetlands, including freshwater complexes. The point being, we have no idea what wetlands we have lost or how they were arrayed over the landscape. The only attempt I have found at quantifying the extent of historical wetlands was in the Legacy Parkway Wildlife Impacts Analysis Technical Memorandum (2005) prepared by Jones and Stokes. The historic hydric soils were mapped for the lower drainages into the eastern portion Great Salt Lake. The estimate of wetlands lost is 58%. It should also be noted that some wetlands do not display hydric soil characteristics, so the loss is probably greater.

As growth continues in our region along with planning and restoration projects being developed, we need a record of our historical wetlands which includes more than acreage. Where were these wetlands, what classes and subclasses existed and how were they situated on the landscape?

Nancy S. Keate, PhD
Utah Division of Wildlife Resources

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Discovering Our Lake

Antelope Island State Park and Our Sense of Place

Bison by Michael Slade (www.gslps.com)

Capt. Howard Stansbury Report, Friday, April 5.

"Antelope Island is the largest of the islands in the lake. It is about sixteen miles in length and five miles broad in its widest part. Like all the other islands in the lake, and indeed, all the prominences observed west of the Wahsatch range and within its valley, it consists of a long rocky eminence, ranging from north to south, rising abruptly from the water and attaining an elevation of about three thousand feet about the level of the lake. A party was sent up the mountain to erect a triangulation station upon its highest peak. The officer charged with that duty describes the view from this elevation as grand and magnificent, embracing the whole lake, the islands, and the encircling mountains covered with snow – a superb picture set in a framework of silver."

–Exploring the Great Salt Lake; The Stansbury Expedition of 1849-50 edited by Dr. Brigham D. Madsen

Comprised of some of the oldest rocks exposed in Utah, the Farmington Canyon Complex, more than 2.5 billion years old, Antelope Island has a long and rich history that dates back before Anglo settlement in the valley of Great Salt Lake.

Antelope Island was named by John C. Fremont in 1845 after finding antelope there. Soon after and through the mid 1870's, the Mormon Church grazed their livestock herds on the island. The spring-fed wetlands in the eastern lowland areas and upland habitats dominated by sagebrush-grassland communities provided excellent forage of native grasslands for their stock. The historic Fielding Garr Ranch was the first ranching complex established on the island.

During the 1880's, three homesteads were established. The only remaining evidence of those homesteads is that of George and Alice Frary, who lived on the island for 5 years. Frary Peak, the highest peak on the island, is 6,597 ft which is about 2,400 feet above the historic average lake level of 4,200 ft.

All 42 square miles of this extremely rugged and photogenic landscape, is home to an abundance of wildlife. The large mammals that include pronghorn, bighorn sheep, mule deer and bison populations are all carefully balanced by park management to remain within the carrying capacity of the island's ranges. But keep your eyes open for the smaller critters too - the burrowing owls, bobcats, amphibians and reptiles, and of course - all of those birds.

In 1969, after an initial purchase by the State of 2000 acres of the north end of the island, Antelope Island became a State Park. The remainder of the island was purchased from the Anschutz Corporation in 1981.

Connected by a 7.5 mile causeway to the mainland in Davis County, its close and convenient proximity to our growing metropolitan area draws hundreds of thousands of visitors to its shores annually.

Whether it's for the variety of activities that are held throughout the year - the Bison Roundup, the Moonlight Bike Ride, 4th of July Hike, Jr.Ranger Programs and Star Parties or simply just to hike, bike or horseback ride, the island is generous with its quiet beauty and peaceful solitude.

The primary challenge of the future will be to protect the island from its own popularity and safeguarding the island's natural resources and recreational opportunities.

Crystal Carpenter
Park Naturalist
Antelope Island State Park
(801) 721-9569

Park Hours:
March: 7 a.m. to 7 p.m.
April: 7 a.m. to 9 p.m.
May through September: 7 a.m. - 10 p.m.
October: 7 a.m. to 8 p.m.
November through February: 7 a.m. to 6 p.m.

Visitor Center and Fielding Garr Ranch Hours:
September 15 to April 14: 9 a.m. to 5 p.m.
April 15 to September 14: 9 a.m. to 6 p.m.

Holiday Closures:
Thanksgiving and Christmas Days

Pricing:
Day Visits: $9 / $6 cyclists and pedestrians
Camping: $12

Directions:
Take Exit 332 off Interstate 15, then drive west on Antelope Drive to the park entrance.

For more information:
Utah State Parks 800-322-3770 or 801-322-3770.

Antelope Island Toward Stansbury by Charles Uibel (www.greatsaltlakephotos.com)

HOW TO REACH US

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GREAT SALT LAKE PEOPLE

Congratulations to Alisa Schofield, for her recent appointment by the governor's office to Utah Geological Survey Board. As a Great Salt Lake educator and 9th grade earth science teacher at West High School, Alisa will bring an important and unique perspective to the UGS Board.

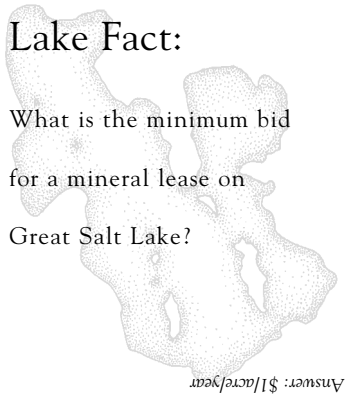
Congratulations to Kathy Van Dame, Wasatch Clean Air Coalition, for her recent appointment by the governor's office to serve on the Utah Air Quality Board. Kathy has been tracking air quality issues for a long time and will represent the environment/conservation community. She will do a great job in that capacity.

Farewell A. Joel Frandsen, who has retired from his position as Utah State Forester and Director of the Division of Forestry, Fire and State Lands in the Department of Natural Resources. Frandsen was State Forester and Director since 2002, after succeeding Art DuFault. The Division is responsible for the management of state sovereign lands, which includes our Great Salt Lake. He will be missed. Good luck, Joel.

Kudos to Dr. Jon Bart, USGS and Adam Koslowski, UDWR for their work with our Mexican linking partners in Marismas Nacionales, MX to help establish a permanent avian resource assessment or monitoring program in Marismas and to help form the bases of other monitoring efforts important to the Marismas watershed. Abrazos!

Lake Fact:

What is the minimum bid for a mineral lease on Great Salt Lake?



Answer: $1/acre/year